What is claimed is:

1. A process for abrading bulk parts which are associated with and constitute at least part of a flowable bulk mass of solid elements, comprising the steps of:

providing a generally horizontally elongated treating channel having a width which is small relative to the channel length and which extends between inlet and outlet locations for said mass;

supplying a substantially continuous stream of said flowable bulk mass into said treating channel at said inlet location;

vibrating the treating channel so that the flowable bulk mass supplied thereto at the inlet location flows as a substantially continuous stream lengthwise along the channel away from the inlet location downstream to the outlet location with the vibration of the treating channel causing the flowable bulk mass and the bulk parts associated therewith to undergo a gentle and substantially continuous movement within the channel along a generally helical flow path which extends lengthwise of the channel so that the individual bulk parts are gently rotatably moved in a generally transverse circular path and are simultaneously advanced lengthwise of the channel toward the discharge location;

transversely discharging toward the flowing bulk mass in the channel an abrasive spray defined by high-velocity air containing entrained abrasive particles to define a spray zone which contacts and penetrates into the flowing bulk mass at a location spaced upstream from the discharge location to effect abrading of the parts as they move through the spray zone due to the gentle rotation of the parts transversely of the channel and the simultaneous lengthwise advancement thereof due to the vibration of the channel; and

discharging the substantially continuous stream of the flowing bulk mass including therein the abraded parts from the channel at the discharge location;

whereby the flowing bulk mass is supplied to, moved along, and then discharged from the channel in a substantially first-in first-out manner.

2. A process according to Claim 1, wherein the vibrating of the channel causing the bulk mass to flow downstream of the channel along the helical flow path causes adjacent convolutions of the helical movement to be only a small distance apart in the lengthwise direction of the channel, and wherein the discharging of the abrasive spray into the flowing mass within the channel causes the spray zone where it contacts and penetrates into the mass to extend over a contact distance in the lengthwise direction of the channel which at least equals said small distance between adjacent convolutions of the flowing mass so that substantially all parts within the flowing mass move into and through the spray zone during a single passage of the flowing mass along the channel.

3. A process according to Claim 2, wherein the contact area of the spray zone with the flowing mass in the lengthwise direction of the channel is in the range from about one to about one and one-half times the small distance defined between adjacent convolutions of the flowing mass.

4. A process according to Claim 3, wherein the horizontally elongate channel has a generally spiral configuration as it extends from the inlet location to the outlet location, and the outlet location is disposed on the spiral radially outwardly of the inlet location.

5. A process according to Claim 1, wherein the discharging of the abrasive spray into the flowing mass causes the discharged spray where it contacts and penetrates the mass to effect contact with the mass over a distance in the lengthwise direction of the channel which at least slightly exceeds the lengthwise advancement of the parts as they move from one to an adjacent convolution of the helical flow path so that substantially all of the parts are moved into and through the spray zone during a single passage of the flowing mass along the channel.

6. A process according to Claim 5, wherein the discharging of the abrasive spray into the flowing mass occurs from a location which is positioned close to but above the flowing mass so that the discharged spray contacts the flowing mass over a substantial width of the channel and penetrates downwardly into the mass over a substantial depth.

7. A process according to Claim 5, including the step of discharging a second abrasive spray into the flowing mass within the channel at a location spaced downstream from said first-mentioned abrasive spray with said second abrasive spray being defined by high-velocity air containing entrained abrasive particles to define a second spray zone which penetrates into the flowing mass to effect abrading of the parts as they move through the second spray zone.

8. A process according to Claim 7, wherein the abrasive particles discharged into the flowing mass at said second spray zone has physical properties which are different from the abrasive particles discharged into said mass at said first-mentioned spray zone to permit different surface treating of the parts as they

sequentially move through the first-mentioned and second spray zones.

9. A process according to Claim 8, wherein each of the first-mentioned and second abrasive sprays are discharged at locations disposed closely adjacent but above the flowing mass so as to be discharged downwardly onto and into the flowing mass as it moves lengthwise along the channel.

10. A process according to Claim 8, including effecting separating of a significant quantity of said abrasive particles as supplied at said first-mentioned spray zone from said mass and discharging said separated abrasive particles from said channel at a location which is disposed downstream of said first-mentioned spray zone but upstream of said second spray zone.

11. A process according to Claim 1, wherein the channel has a rounded concave bottom wall, a width in the range of from about four inches to about eight inches, and an arcuate configuration extending through an angle of at least about 360°.

12. A process for treating the surfaces of flowable solid parts, comprising the steps of:

providing a tublike vibrator device having therein a generally horizontally-elongated treating channel which is of narrow width and which extends arcuately about a center point;

providing a flowable mass of solid elements with at least a quantity of said elements comprising individual flowable solid parts;

vibrating the tublike device to cause the mass of solid elements, when supplied to the channel, to flow

lengthwise of the channel while undergoing a corkscrew-like motion wherein the elements undergo a gentle rotatable tumbling movement through numerous closely-adjacent transverse convolutions as the mass slowly moves lengthwise along the channel;

supplying said flowable mass into said channel so that the mass, over a length of the channel, fills the channel to a significant depth which is less than the maximum channel depth as the mass advances slowly along the channel;

providing a spray arrangement positioned adjacent the channel so that a discharge orifice thereof is positioned closely adjacent and above the flowing mass and is oriented generally downwardly toward the flowing mass;

discharging from said orifice an abrasive stream comprising a high-velocity fluid carrier having small abrasive particles entrained therein and directed generally downwardly into the flowing mass to define a concentrated spray zone which contacts a small concentrated surface area of the upper surface of the flowing mass and which penetrates a substantial distance downwardly into the flowing mass to effect treating of multiple surfaces of the parts as they slowly tumble during their passage through the spray zone during the corkscrew-like movement of the flowing mass; and

continuing the corkscrew-like motion of the flowing mass downstream away from the spray zone.

13. A process according to Claim 12, including the steps of:

providing a second spray arrangement positioned adjacent the channel at a location which is disposed in spaced relationship from the first-mentioned spray arrangement and which is disposed downstream thereof

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relative to the lengthwise direction of movement of the flowing mass along the channel; and

discharging from an orifice associated with said second spray arrangement a surface treating stream which is directed generally downwardly into the flowing mass to define a concentrated spray region which covers a significant part of the width of the upper surface of the flowing mass and which penetrates a substantial distance downwardly into the flowing mass to effect surface treating of the parts as they slowly rotatably tumble during their passage through the spray region during the corkscrew-like movement of the flowing mass, said spray region being located downstream of and spaced from the spray zone defined by said first-mentioned spray arrangement.

14. A process according to Claim 13, wherein the treating stream discharged from said second spray arrangement is different from the abrasive stream discharged from said first-mentioned spray arrangement so as to effect a different surface treatment of the parts as they move through the spray region.

15. A process according to Claim 12, including providing the treating channel of the tublike vibrator device with first and second generally annular channel parts which effectively surround one another and are in lengthwise communication with one another to effectively define a path having multiple convolutions.

16. A process according to Claim 12, wherein the abrasive spray contacts the surface area of the mass over a small lengthwise extent which is at least slightly greater than the lengthwise distance defined by adjacent transverse convolutions of the flowing mass.

17. A process according to Claim 16, wherein the channel is defined by bottom and side walls which are joined by rounded corners so that a bottom portion of the channel has a generally rounded configuration and the channel has a relatively narrow width so that the vibration of the device causes the flowing mass to undergo numerous closely adjacent convolutions as the mass is advanced lengthwise along the channel so that substantially all of the parts are effectively moved upwardly into and through the spray zone during the corkscrew-like movement of the mass.

18. A process according to Claim 12, wherein the fluid carrier discharged from said spray arrangement comprises a gas having a discharge velocity of at least about 80 feet per second.

19. A process according to Claim 12, wherein the parts are of a delicate or frangible material and/or have a complex three-dimensional configuration.

20. A process according to Claim 12, including positioning the orifice of said spray arrangement substantially at a mouth of said channel and spaced upwardly a small distance above the flowing mass so that the discharged abrasive spray is confined within the channel and is allowed to diverge sidewardly so that the spray zone, where it contacts the flowing mass, extends across a substantial part of the channel width;

maintaining the abrasive which is sprayed into the mass within the flowing mass for further abrasive contact with the parts as the flowing mass moves lengthwise of the channel away from the spray zone; and

providing said flowing mass with bulk inert tumbling elements having a shape which is different from the shape of the parts and mixed with said parts to provide for

carrying and spacing of the parts as they are tumbled along the channel.

21. An apparatus for effecting abrasive finishing of solid parts, comprising:

a housing structure defining therein a horizontally elongate treating channel which is of narrow width for accommodating therein a flowable bulk mass of solid parts which are to be abrasively treated;

a vibratory device connected to said housing for effecting a generally horizontal gyratory movement thereof so that the bulk mass in the treating channel undergoes a gentle tumbling movement which assumes a generally corkscrew-like pattern wherein the parts undergo a gentle rotatable tumbling movement through numerous closely-adjacent transverse convolutions as the mass slowly moves lengthwise along the channel;

a discharge nozzle arrangement stationarily positioned adjacent the channel so that a discharge orifice thereof is positioned closely adjacent the flowing mass within the channel; and

a supply system connected to the discharge nozzle arrangement for supplying high pressure gas and abrasive particles to said nozzle arrangement for effecting discharge of high-velocity gas having solid abrasive particles entrained therein from said nozzle arrangement to create a discharged abrasive stream which is directed into the flowing mass to define a concentrated spray zone which contacts a small concentrated surface area of the flowing mass within the channel and which penetrates a substantial distance inwardly into the flowing mass to effect treating of multiple surfaces of the parts as they slowly tumble during their passage through the spray zone during the corkscrew-like movement of the flowing mass.

22. An apparatus according to Claim 21, wherein a plurality of said discharge nozzle arrangements are disposed in association with the channel and spaced longitudinally therealong for discharging separate sprays into the flowable bulk mass at different lengthwise locations along the channel, and wherein different said discharge nozzle arrangements are supplied with different solid particulate abrasive media so that the discharges from the different nozzle arrangements effect different treating functions on the flowable bulk mass.

23. An apparatus according to Claim 22, wherein the channel includes two or more generally annular channel sections which generally circumferentially surround one another and which are in longitudinal communication with one another.

24. An apparatus according to Claim 23, wherein the annular channel sections define a spiral.

25. An apparatus according to Claim 21, wherein the channel defines a closed loop.

26. An apparatus according to Claim 21, wherein the channel is defined by a wall arrangement having bottom and side walls which define a generally rounded confining wall which extends through an angular extent in excess of 180° and having an upper mouth which opens into the channel and is narrower than the width of the channel spaced downwardly from the mouth.

27. An apparatus according to Claim 21, wherein said channel has a maximum width of about eight inches and, in cross section, and a rounded concave bottom wall.

28. An apparatus according to Claim 21, wherein a discharge orifice of the nozzle arrangement is positioned a small distance above the flowing mass within the channel and is oriented generally downwardly.

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